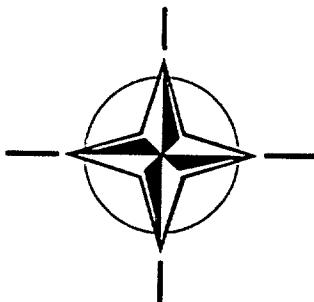


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**NORTH ATLANTIC TREATY ORGANIZATION
(NATO)**

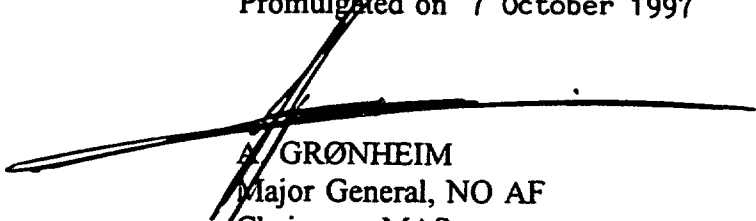


**MILITARY AGENCY FOR STANDARDIZATION
(MAS)**

**STANDARDIZATION AGREEMENT
(STANAG)**

SUBJECT: **FORDING AND FLOTATION REQUIREMENTS FOR COMBAT
AND SUPPORT GROUND VEHICLES**

Promulgated on 7 October 1997


A. GRØNHEIM
Major General, NO AF
Chairman, MAS

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RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.
2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "In NATO Standardization, the fulfilment by which a member nation formally accepts, with or without reservation, the content of a Standardization Agreement" (AAP-6).
5. Implementation is "In NATO Standardization, the fulfilment by a member nation of its obligations as specified in a Standardization Agreement" (AAP-6).
6. Reservation is "In NATO Standardization, the stated qualification by a member nation that describes the part of a Standardization Agreement that it will not implement or will implement only with limitations"(AAP-6).

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

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RATIFICATION AND IMPLEMENTATION DETAIL
STADE DE RATIFICATION ET DE MISE EN APPLICATION

Nation	National Ratification / Reference de la ratification nationale	National Implementing / Document national de mise en application	Implementation/Mise en application					
			Forecast / Date prévue			Actual Date / Date réelle		
			NAVY MER	ARMY TERRE	AIR	NAVY MER	ARMY TERRE	AIR
BE								
CA*	2441-2805(DVEM 3) of/du 30.06.95	STANAG 2805					06/95	
DA*	MA204.69-S2805/MAM3-18443 of/du 19.09.96	STANAG 2805					10/97	
FR								
GE*	BMVg-Fü S IV 2 Az 03-51-60 of/du 09.11.95		02/98	02/98	02/98			
GR								
IT	312/1435/97/USG of/du 22.04.97						12/96	
LU	BO 5695/94 of/du 22.04.97					WILL NOT IMPLEMENT / NE METTRA PAS EN APPLICATION		
NL	M94025951 of/du 09/11/94	STANAG 2805 (NAVY)				10/97	10/97	10/97
NO	MAS-12/97/FO/HST/ELA/ST2805 of/du 25.03.97	STANAG 2805					01/97	
PO	RRN 138/96/DA of/du 13 Sep 96	STANAG 2805				08/96	03/94	
SP	NORMAT/13/2805/05/00 of/du 22.08.96	STANAG 2805				01/97	01/97	01/97
TU								
UK	D/DSTAN/341/8/2805 of/du 05.09.94	STANAG 2805				10/97	10/97	10/97
US	SAUS-IA-IPP of/du 16.07.97						10/97	

* See overleaf reservations/Voir réserve au verso

+ See comments overleaf/Voir commentaires au verso

x Service(s) implementing/Armée(s) mettant en application

Releasable to NACC/PFP ☐ Non releasable ☐ /

Peut être communiqué au CCNA/PPP ☐ Ne peut être communiqué ☐

OTAN SANS CLASSIFICATION

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N A T O U N C L A S S I F I E D

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RESERVATIONS/RESERVES

CANADA

Will not retrofit present equipment but will incorporate the STANAG in future acquisitions

Ne modifiera pas en rattrapage le matériel actuel mais tiendra compte du STANAG dans les acquisitions futures.

DENMARK/DANEMARK

Does not require armoured vehicles to be able to negotiate water obstacles by snorkel fording or by flotation

N'a pas besoin de véhicules blindés aptes à franchir des obstacles aquatiques par passage de gués sous l'eau ou par flottabilité.

GERMANY/ALLEMAGNE

Reserves the right to reduce the fording depth requirements at para. 6.a(4) to 700mm

Se réserve le droit de réduire à 700 mm la profondeur de franchissement stipulée à l'alinéa 6(a)(4).

N A T O S A N S C L A S S I F I C A T I O N

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NAVY/ARMY/AIR

NATO STANDARDIZATION AGREEMENT
(STANAG)

FORDING AND FLOTATION REQUIREMENTS FOR
COMBAT AND SUPPORT GROUND VEHICLES

ANNEX A: The Determination of Green Water Depths.

AIM

1. The aim of this agreement is to standardize fording and flotation requirements to be met by combat and support ground vehicles, to meet interoperability objectives.

AGREEMENT

2. Participating nations agree to adopt the requirements for fording and flotation of combat and ground support vehicles as described in this STANAG.

DEFINITIONS

3. For the purpose of this agreement, the following definitions apply:

a. Fording. The capability of a ground vehicle to negotiate a water obstacle with its wheels or tracks in contact with the ground.

(1) Shallow Fording. The capability of a combat or support ground vehicle equipped with built-in water-proofing, with its wheels or tracks in contact with the ground, to negotiate a water obstacle without the use of a special water-proofing kit.

(2) Deep Fording. The capability of a combat or support ground vehicle equipped with built-in water-proofing, and/or a special water-proofing equipment kit to negotiate a water obstacle with its tracks or wheels in contact with the ground.

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- (3) Snorkel Fording. The capability of a combat or support ground vehicle equipped with built-in water-proofing and/or a special water-proofing kit, to negotiate a water obstacle with its wheels or tracks in contact with the ground, completely immersed.
- b. Flotation. The capability of a combat vehicle or support ground vehicle to float in water and negotiate a water obstacle.
- c. Ground Combat or Support Vehicle. A self-propelled, boosted or towed conveyance primarily designed for military operations in close proximity to the line of contact.
- d. Green Water. The actual depth at any point from the bottom to the surface, allowing for wave movement.
- e. Apparent Green Water Depth. This defines the minimum height on the vehicles which needs to be protected from Green Water - the maximum depth encountered by the vehicle on entering or leaving water.
- f. Splash Height. The additional height of protection needed, above the green water depth, to protect equipment against water splash caused by spray, undue turbulence, wind action on wave tops, and by waves rebounding from solid objects such as landing craft, ships or the equipment itself.

DETAILS OF AGREEMENT

- 4. Scope of Agreement
- a. STANAG 2805 is for use by the following NATO Forces:
 - (1) NATO Army Forces.
 - (2) These elements of NATO Naval and Air Forces operating in a ground role, eg marines, naval landing parties and air force ground personnel.

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- b. This agreement applies to the following:
- (1) Future designs of combat and support ground vehicles.
 - (2) Combat and support ground vehicles, currently in the development stage, which could be modified at reasonable cost to embody fording and/or flotation characteristics.
 - (3) Combat and support ground vehicles, in service which could be modified at reasonable cost without major adverse changes to their military characteristics.
- c. This Agreement does not apply to those military vehicles whose main task is the transport of loads on prepared roads.
5. General
- a. Combat and support ground vehicles are to be built (or, where permitted by this Agreement, equipped with special kits) to give them the capability of fording fresh water and salt water to a depth necessary for the accomplishment of their mission.
 - b. The depth of water that the vehicle is required to ford (either prepared or unprepared), should take into account sinkage, ramp angle, vehicle overhang and wave height. This depth is a measurement perpendicular to the ground on which the vehicle is operated, (ramp, beach, river bed, etc), to the surface of the water. (Annex). In addition to the fording depth, splash height is another consideration for which a lesser degree of water-proofing may be acceptable, up to a maximum height of 500mm (20 inches) depending on vehicle height.
 - c. Vehicles are required to negotiate safely prepared, still-water entry gradients of 23° under their own power at slow speeds.

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6. Shallow (Unprepared) Fording. Combat and support ground vehicles are to be capable of fording continuously for up to 2 hours at the depths indicated below with minimum preparation. During fording, the engines of self-propelled vehicles must be capable of being stopped up to 10 minutes, and started, and the vehicle operated in reverse.

a. Fording Depths

- | | |
|-------------------------------------|---------------------|
| (1) Amphibious Plant. | 1,500mm (60 Inches) |
| (2) Tanks and Armoured Vehicles. | 1,000mm (40 Inches) |
| (3) Vehicles under 2 tonne payload. | 500mm (20 Inches) |
| (4) Other Vehicles. | 750mm (30 Inches) |

b. Combatability shall not be degraded during shallow fording operations.

7. Deep (Prepared) Fording

a. The following combat and support ground vehicles, either with built-in water-proofing or by the use of special water-proofing kits, shall be capable of deep fording for at least 6 minutes continuous driving at the depths indicated.

- (1) Tanks and Armoured Vehicles - to 500mm below the top of the turret or roof with a minimum depth of 1,500mm
- (2) Vehicles under 2 tonne payload not required for amphibious operational purposes - 750mm (30 Inches)
- (3) All other vehicles, irrespective of size that are required for amphibious operational purposes, to 1,500mm (60 Inches).

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- (4) Trailed loads less than 1,500mm in height could obviously be subject to complete immersion if they do not float. Trailed loads should NOT float while being towed by a vehicle which itself is in the water, and which is obtaining its traction by contact with the ground.

NOTE: A small vehicle, which at extreme depth will itself have only marginal traction, can get into serious difficulties if it is further hampered by a floating trailer in tow, which is being swept to one side by a strong tide or current.

- b. The waterproofing kits used to achieve these depths by deep fording should be of two stage, semi-permanent design. The final stage should be capable of being installed by the crew, using simple hand tools. Final stage installation time should not exceed two hours.

- c. Combatability may be degraded somewhat during deep fording operations.

8. Snorkel (Prepared) Fording

- a. Tanks and other armoured vehicles will have the capability to negotiate a water obstacle, up to 4 metres deep, being completely immersed, for at least fifteen minutes in duration.
- b. Compatibility is completely lost during underwater fording operations. It is, however, desirable to maintain radio communication.

9. Flotation.

- a. Combat and support ground vehicles may be given the capability of floating as an alternative to fording. This can be done using either a built-in facility or an applique kit. In either case, preparation is required before entering the water.

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- b. When vehicles are required to float, it is desirable that:
 - (1) Self-propelled vehicles be capable of travelling through water under their own power and, if possible, without additional water-proofing equipment. Allowance must be made for the adverse effects of:
 - (a) Entry and exit angles.
 - (b) A combination of wind, tide and current, equating to a current of 1.7m/s (3.2 knots) maximum.
 - (2) If additional water-proofing equipment is required, such equipment is to be:
 - (a) Easily erected and dismantled in the field.
 - (b) Usable more than once without removal.
- 10. Readiness to Operate after Fording and Flotation
 - a. Self-propelled vehicles must be capable of operating continually on land without damage, after very minor servicing/removal of any special water-proofing kit, which may have been necessary. This servicing/removal must be conducted within 15 minutes of leaving the water.
 - b. Should the retention of the special water-proofing kit give rise to functional or operational difficulties, covers, stacks and flotation screens should be capable of being jettisoned or otherwise removed, or returned to a stowed position within five minutes of arriving at the shore line.
 - c. Self-propelled and towed guns, and the main armament of vehicles, are to be capable of being brought into action immediately after any fording or flotation equipment has been removed or stowed.

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IMPLEMENTATION OF THE AGREEMENT

11. This STANAG is implemented when the necessary orders or instructions have been issued, to ensure that the requirements covered by this Agreement are applied to the future design of combat and support ground vehicles and to the modification of combat and support vehicles in development or in service, as stipulated herein.

THE DETERMINATION OF GREEN WATER DEPTHS

- x VEHICLE OVERHANG
- θ RAMP ANGLE
- a STILL GREEN WATER DEPTH
- b WAVE HEIGHT (CREST TO TROUGH)
- c SINKAGE
- d SPLASH HEIGHT
- e MAX GREEN WATER DEPTH $\left[(a + \frac{b}{2} + c) / \cos \theta \right]$
- f APPARENT GREEN WATER DEPTH DUE TO OVERHANG $(e + x \tan \theta)$
- g (f) INCREASED BY THE EFFECTS OF SPLASH AND SPRAY

